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AUTHOR Camras, Linda A.
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ABSTRACT

To make the point that infant emotions are more dynamic than suggested by Differential Emotions Theory, which maintains that infants show the same prototypical facial expressions for emotions as adults do, this paper explores two questions: (1) when infants experience an emotion, do they always show the corresponding prototypical facial expression?; and (2) do the facial configurations of the AFFEX coding system (described by Izard, Dougherty, and Hembree) for anger, sadness, and pain really express discrete emotions? To support the argument, the results of laboratory studies and naturalistic observations are cited. Several studies of babies' facial expressions have shown that babies do not always produce expressions of fear or surprise in situations that normally induce those emotions. The lack of situational specificity (the expression of an emotion in a situation in which the emotion is assumed to be present, and the lack of its expression in other situations) for anger, sadness, and pain found by some studies suggests that the expressions may reflect a general form of negative affect. Studies that involved observer judgments of infant facial expressions found that judgments were less accurate than expected. The report concludes that the AFFEX configurations are probably not expressions of discrete anger, sadness, and pain, and offers three possible explanations of the relationship between infants' emotion and expression: (1) infants have discrete emotions of pain, anger, and sadness and emotion-specific facial expressions, although researchers have not yet discovered what those expressions are; (2) infants show the same expressions for anger, sadness, and pain; and (3) infants do not have discrete negative emotions, but do have a less differentiated state of distress. (TJQ)

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Facial Expressions in Context: Contributions to Infant Emotion Theory[1]

Linda A. Camras
DePaul University

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I'd like to begin today by assuming a compromising position; -- ie., a theoretically compromising position. The point I'd like to make is that discrete emotion theories consider emotions to be dynamical systems if you use the term dynamical in a broad sense, meaning "active, changing or varying". However, I also believe that infant emotions are more dynamical than discrete emotion theories currently suggest.

Now, Cal Izard (1991, Izard & Malatesta,1987; Malatesta-Magai & Izard, 1991) is pretty much the only one who has explicitly extended discrete emotions theory into the domain of development. And for this reason, I'll talk a bit more specifically abt his theory, which he calls Differential Emotions Theory (DET). Accdg to this theory, the basic emotions emerge during infancy according to a maturational timetable. When infants experience an emotion, they are supposed to show the same prototypic facial expressions as adults do. However, there is one impt difference. As we all know, adults will often modify their spontaneous facial expressions by inhibitin, masking, or even amplifying them. This one of the dynamic features of discrete emotion theories. However, according to DET, during the 1st year, the theory assumes that infants don't voluntarily modify their facial behavior. So they always show the facial expression when they experience the emotion and vice versa.

Now as I said before, my point today is that infant emotions are more dynamical than DET currently suggests. And to make this point, I'm going to raise several questions abt the theory.

Here is the first question: when infants are experiencing an emotion, do they indeed always show the corresponding prototypic facial expression?

And I'm going to call your attention to two emotion situations: the visual cliff for fear, and the vanishing object for surprise. For years we have assumed that infants are indeed fearful or surprised in these situations and yet we know that infants do not typically show fear or surprise expressions. There have been a number of studies that have looked at babies' facial expressions quite systematically (see Camras, Malatesta & Izard, 1991 for review). These have found that full prototypic facial expressions are virtually never seen. And even components of

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expressions, like raised brows for surprise, are usually seen in fewer than half the subjects.

So it appears that infants do not always produce prototypic facial expressions, at least they don't in some of these fear and surprise situations. And so we can say their expression is "dynamical" in that it must be determined by more than just emotion. Presumably, there are contextual factors operating here; but frankly, we don't know what they are. In order to figure that out, we first have to find some fear and surprise situations that usually DO produce the prototypic expressions.

Let me move on to the second question I want to raise. And this has to do with the facial expressions described in Izard's AFFEX coding system (Izard, Dougherty & Hembree, 1983) for the emotions of sadness & anger, and for the related "affect" of distress- phsyical-pain. The question I want to raise is: do these 3 facial configurations really express discrete anger, sadness and pain? And if they don't, what might this imply about the dynamics of infant emotions and emotional development?

I'm going to start by briefly reviewing what we know about these facial configurations in terms of their contextual occurrence, accompanying nonfacial actions and observer judgements of their emotion content.

Start with contextual occurrence (see Camras, Malatesta & Izard, 1991, for detailed review and reference citations). In 1979, Hiatt, Campos & Emde proposed that contextual occurrence could be evidence for an expression's emotion status IF you could show "situational specificity", ie, the expression occurs in situations where you assume the emotion is present and does not occur in other situations. Now it certainly is true that the discomfort/pain configuration is observed in obvious pain situations (e.g. Izard's beautiful & innovative innoculation studies). And the anger configuration has been observed in situations which we might reasonably expect to provoke anger in infants (e.g. Campos' arm restraint and cookie removal studies). However, the problem is that these expressions are also shown in other situations. E.g. Matias, Cohn & Ross observed the discomfort/pain exp during face-to-face interactions between mothers and 4 mo old infants. In this type of situation, you might expect the infant to sometimes get upset but you wouldn't expect the infant to be in physical pain.

Anger expressions also don't seem to be very specific to anger situations. In fact, they are the most frequent negative expression shown during all laboratory procedures that evoke negative affect in infants, including arm restraint, cookie removal, presentation of unusual masks, separation from mother during the Strange Situation, and even innoculation (for infts over 2 mo).

Sadness expressions also don't seem to be very specific; they haven't received very much attention, but if you look at the data presented for all the procedures I mentioned above, you find that the sadness configuration is seen in all these situations and always at the same low frequency (3-5%).

So laboratory studies have not really shown situation specificity for the Affex-described discomfort/pain, anger & sadness configurations. What about more natural settings? Well, before I reviewed the literature and realized all this, I set out do a naturalistic study of my daughter Justine's expressive behavior during infancy. And in my touching state of naivete, I expected to find all of these expressions in emotion-appropriate situations, only hopefully at younger ages than previously cited. Instead, I found that Justine tended to show all 3 facial expressions in the same set of situations (Camras, 1992). And, in fact, she would often cycle from one to another during a single bout of crying.

So to summarize this section, if we had appropriate situation specificity, this might suggest that the 3 AFFEX configurations are expressions of pain, anger & sadness. Lack of situational specificity suggests that they may instead reflect some more general form of negative affect.

Let me move on to the data on observer judgements. According to discrete emotions theory, observers should be able to accurately recognize the pain, anger & sadness configurations because communication is an important aspect of their adaptive function (and because the morphology of the infant expressions is supposed to be the same as the morphology of the adult expressions which are universally recognizable). However, it turns out that observers don't recognize some of these expressions as accurately as one might expect. For example, in an oft-cited study, Izard (Izard, Huebner, Risser, McGinnes, & Dougherty, 1980) showed judges still photos of infant expressions, including the configurations for anger & sadness (but not discomfort/pain). He used a forced choice procedure, asking judges to choose from a list of 6 emotion words. And he found that judges chose sad for the sadness configuration 63% of the time, which is good, but not great. However, for the anger configuration, judges chose anger only 29% of the time, which is definitely not so good.

More recently, Oster, Hegley & Nagel (1992) modified the forced choice judgement procedure by asking judges to make multiple ratings for each photo. Ie, using 9 point scales, judges rated each photo for each of 8 emotions, including 4 discrete negative emotions (anger, sadness, disgust & fear) and also for "distress" --which Oster and many others consider a more general, less-differentiated form of negative affect. Oster found that judges often rated the discomfort/pain, anger & sadness configurations higher for distress than for the predicted discrete emotions OR the judges gave equally high ratings for several negative emotions, suggesting that they thought the configuration was some sort of emotion blend.

Even more recently, Camras, Sullivan & Michel (in press) used a similar judgement procedure but presented the judges with video segments instead of still photos. The segments were taken from videotapes I made of my daughter Justine during her first 2 1/2 months and included her facial expression, accompanying body

movements and vocalizations, and some aspects of the situational context. Each segment was at least 1 1/2 seconds long, showed ONLY one facial configuration (either discomfort/pain, anger or sadness) and showed Justine either in her bath or in her bouncy seat.

Like Oster, we had judges make multiple emotion ratings and we included the term distress as well as the discrete emotion terms. We thought that if we presented the 3 facial configurations in their dynamic context, this might help judges to see Justine as experiencing the predicted discrete emotion. Our results, however, were very similar to Oster's (see Figure 1). If you look at the left and center columns, you see that the discomfort/pain and anger configurations were rated highest for distress.(and several other emotion terms were given ratings that were not significantly lower). Furthermore, if you look at the ordering, you find that pain comes in 6th for the discomfort/pain configurations and anger comes in 4th for the anger configurations. For the sadness configuration (in the last column), again, distress was the highest negative emotion while sadness ranked 6th. One unexpected finding was that happiness was rated slightly higher than any of the negative emotions. We think this is due to a contrast effect: compared to how she looked in the discomfort/pain and anger episodes, Justine looked relatively happy in the sadness ones. However, I don't want to make too much of the rankings for the sadness configuration because all the ratings were relatively low, (averaging about 2 or 3 on a 7 point scale) and there were no significant differences among them. So judges seemed to see the sad-configuration episodes as involving relatively little emotion altogether.

To summarize, presenting the 3 facial configuratons more "naturalistically" didn't seem to help; observers still do not judge them to express the predicted discrete negative emotions.

Let me move on to examine the body activity that goes with the discomfort/pain, anger & sadness facial configurations. Irrespective of emotion judgements, we thought it would be interesting to see if the configurations were accompanied by body activity that might be interpreted as indicating pain, anger or sadness. So, in a second part to the study I just described, we asked new judges to rate the video segments using a set of activity terms: active, flexed, rhythmic, coordinated, still, extended, jerky, & uncoordinated. And here we did find differences between the sad-configurations and the discomfort/pain or anger configurations (Figure 2). In particular, we found that when Justine was showing the discomfort/pain or anger facial configurations, her body movements were rated as being more active, more jerky and less still than for the sad-face segments. There were no differences between the discomfort/pain and anger-face segments.

We thought these results were interesting because, to some extent, they DID seem consistent with a discrete emotions interpretation of the facial configurations. That is, folk

theories of emotion--and some non-folk theories too--do associate sadness with passive --or "still"--behavior while anger and perhaps pain would be associated with a higher level of activity. However, we want to be cautious about using these results as evidence for discrete emotions for 2 reasons: 1. In Part 1 of our studies, our raters also saw the body movement along with the facial expressions, and they DIDN'T judge Justine to experience the predicted discrete emotions, and 2. we think that our findings are partly a result of our selection criteria. That is, if we had chosen different sad-face segments--segments that lasted less than 1 1/2 seconds and occurred during crying--then we probably wouldn't have found that Justine was less physically active when she showed the sad face.

So pulling all this together, I think the evidence thus far suggests that the 3 Affex configurations are probably NOT expressions of discrete anger, sadness, and discomfort/pain. So where does this leave us? Where does this leave us as far as discrete emotions goes? and what does all of this imply about emotion dynamics?

First: I'll address the issue of discrete emotions. Basically, I think there are 3 possibilities:

Possibility 1. Infants DO have the discrete negative emotions of pain, anger & sadness AND they do have emotion-specific facial expressions. But WE don't know what these expressions are. All we know is that they aren't the configurations we've all been studying as specified in the AFFEX system.

Possibility 2. Infants do have these discrete negative emotions but they don't have emotion-specific facial expressions. That is, infants show the same expressions when they are angry, sad or in physical pain.

Possibility 3. Infants DON'T really have discrete negative emotions (or perhaps they experience pain discretely but not anger vs sadness). Instead of anger and sadness, infants may experience a less differentiated state of "distress". And all of the 3 configurations I have been talking about are actually variant expressions of distress. As I mentioned before, this 3rd possibility (or something like it) has been proposed by several researchers, e.g. K Bridges back in the 1930s.

As far as evaluating these possibilities, this could be a bit tricky because it requires some consensus about how to measure emotions in infants besides looking at their facial expressions. And we don't have that kind of consensus. Nevertheless, I think we could all make some fairly reasonable proposals at this point about future research in this area. However, rather than pursue that here, I'd like to go on to (or rather get back to) the issue of emotion dynamics.

I think all three possibilities/alternatives I've listed pretty clearly imply a more dynamic relationship between emotion and expression than you currently see in differential emotion theory. For example, if Possibilities 1 or 2 are true, then the facial expressions accompanying anger, sadness & pain must change pretty radically during the course of development. If

Possibility 3 is true, then there is even more change in the system since both the expressions and the emotions themselves change during the course of development. In any event, I think it is pretty clear that emotions are dynamical systems in more ways than perhaps we've thus far acknowledged. That is, emotions do not automatically produce facial expressions even in young infants. And the correspondence between emotion and facial expression is not invariant across the course of development.

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FIGURE 1

Comparisons Among Emotion Term Ratings for Each AFFEX-specified Expression Type

Affex-specified Expression Type								
Discomfort/Pain			Anger			Sadness		
Emotion Term	Mean Rating	SD	Emotion Term	Mean Rating	SD	Emotion Term	Mean Rating	SD
distress	15.94[a]	3.15	distress	12.88[a]	3.57	happy	8.25[a]	3.64
anger	14.12[ab]	3.81	sad	11.06[ab]	4.68	distress	8.06[a]	3.12
disgust	12.81[abc]	4.21	fear	10.94[ab]	4.95	surprise	7.06[a]	2.54
sad	12.25[bc]	4.55	anger	10.88[ab]	3.59	fear	6.94[a]	3.47
fear	12.19[bc]	4.94	disgust	9.56[abc]	3.70	disgust	6.75[a]	3.75
pain	11.94[bc]	5.45	surprise	9.25[abc]	4.20	sad	6.69[a]	3.55
surprise	9.69[c]	4.58	pain	8.88[bc]	4.36	anger	6.13[a]	3.42
happy	4.31[d]	2.06	happy	6.81[c]	3.83	pain	4.94[a]	2.14

Note. Means are the total ratings for three segments of each expression type, thus scores could range from 3 to 21. Three sets of comparisons; each set makes comparisons among ratings for one of the expression types. Different superscripts indicate significant Tukey test differences, $p < .05$, comparing among ratings for one of the expression types.

FIGURE 2

Comparisons across Affex-specified Expression Types for Activity Term Ratings

	Affex-specified Expression Type					
	Discomfort/pain		Anger		Sadness	
Activity Term	Mean Rating	SD	Mean Rating	SD	Mean Rating	SD
Flexed	13.62[a]	2.99	12.88[ab]	2.39	11.43[b]	3.14
Active	12.00[a]	3.34	12.31[a]	3.36	8.56[b]	3.20
Jerky	12.69[a]	3.59	12.50[a]	2.73	9.63[b]	3.40
Still	10.06[a]	2.95	9.31[a]	3.22	14.81[b]	3.15

Note. Mean of total ratings for three segments of each expression type. Four sets of comparisons; each set makes comparisons among expressions for one of the activity terms. Different superscripts indicate significant Tukey test differences, $p < .05$, comparing among expressions for one of the activity terms.